

FIG. 21 depicts a flow diagram describing an example process of configuring a removable electronics module for a particular type of pre-fabricated sensor assembly in accordance with example embodiments of the present disclosure;

FIGS. 22-23 are top and bottom perspective views depicting an example of a pre-fabricated sensor assembly in accordance with example embodiments of the present disclosure;

FIG. 24 is an exploded perspective view of the example pre-fabricated sensor assembly depicted in FIGS. 22-23 in accordance with example embodiments of the present disclosure;

FIG. 25 is a top detailed view of a subset of the sensing lines of the example pre-fabricated sensor assembly depicted in FIGS. 22-24 in accordance with example embodiments of the present disclosure;

FIG. 26 is a front perspective view depicting another example of a pre-fabricated sensor assembly in accordance with example embodiments of present disclosure;

FIG. 27 is a detailed view of the example pre-fabricated sensor assembly depicted in FIG. 7 in accordance with example embodiments of the present disclosure;

FIG. 28 is a front perspective view depicting an example of a pre-fabricated sensor assembly including conductive threads implemented as a set of conductive lines for a capacitive touch sensor in accordance with example embodiments of the present disclosure;

FIG. 29 is a detailed view of the example pre-fabricated sensor assembly depicted in FIG. 9 in accordance with example embodiments of the present disclosure;

FIG. 30 illustrates an example of an interactive object with multiple electronics modules in accordance with example embodiments of the present disclosure;

FIG. 31 is a front perspective view depicting another example of a pre-fabricated sensor assembly including conductive threads implemented as a set of conductive lines for a capacitive touch sensor in accordance with example embodiments of the present disclosure;

FIG. 32 is a front perspective view depicting an example of a pre-fabricated sensor assembly attached to a strap of an interactive garment accessory in accordance with example embodiments of the present disclosure;

FIG. 33 is a side perspective view depicting the example pre-fabricated sensor assembly and interactive garment accessory depicted in FIG. 13 in accordance with example embodiments of the present disclosure;

FIG. 34 is an illustration of a person wearing an interactive backpack including a pre-fabricated sensor assembly in accordance with example embodiments of the present disclosure;

FIG. 35 depicts a receptacle of a pre-fabricated sensor assembly and illustrates a removable electronics module being physically coupled to an interactive object via the receptacle in accordance with example embodiments of the present disclosure;

FIG. 36 is an illustration of an interactive garment depicting the insertion of a pre-fabricated sensor assembly into the interactive garment in accordance with example embodiments of the present disclosure;

FIG. 37 depicts a block diagram illustrating an example process of manufacturing an interactive object using a pre-fabricated sensor assembly in accordance with example embodiments of the present disclosure; and

FIG. 38 illustrates various components of an example computing system that can be implemented as any type of client, server, and/or computing device as described herein.

DETAILED DESCRIPTION

Reference now will be made in detail to embodiments, one or more examples of which are illustrated in the drawings. Each example is provided by way of explanation of the embodiments, not limitation of the present disclosure. In fact, it will be apparent to those skilled in the art that various modifications and variations can be made to the embodiments without departing from the scope or spirit of the present disclosure. For instance, features illustrated or described as part of one embodiment can be used with another embodiment to yield a still further embodiment. Thus, it is intended that aspects of the present disclosure cover such modifications and variations.

Generally, embodiments in accordance with the present disclosure are directed to methods and systems related to pre-fabricated sensor assemblies for interactive objects and removable electronics devices (also referred to as removable electronics modules) that are configured to interface with different types of pre-fabricated sensor assemblies, such as may be incorporated within different types of interactive objects. More particularly, a removable electronics device in accordance with example embodiments of the disclosed technology can be configured to interface with various types of touch sensors that may be integrated within different pre-fabricated sensor assemblies. Additionally, the removable electronics device can be configured to interface with one or more sensors integrated within the removable electronics device, such as an inertial measurement unit. The removable electronics device may be configured to physically and removably couple to sensor assemblies having different form factors, as well as for communication with touch sensors having different sensor layouts of sensing elements, etc. In this manner, a user may utilize a single removable electronics device that can automatically interface with different types of sensor assemblies in order to interact with various types of interactive objects.

By way of example, a removable electronics device in accordance with example embodiments may be configured to interface with pre-fabricated sensor assemblies having different types of sensors. For example, a first pre-fabricated sensor assembly may have a first type of capacitive touch sensor, such as may be integrated within a first type of interactive object (e.g., a jacket). The first type of capacitive touch sensor may include sensing elements having a first sensor layout. The sensor layout may refer to a sensing element material (e.g., metal line, conductive thread, etc.), a number of sensing elements of the touch sensor a shape of the sensing elements (e.g., lines, squares, circles, or other shape), a dimension of the sensing elements, and/or a spacing between sensing elements, etc. The removable electronics module may be further configured to interface with a second pre-fabricated sensor assembly having a second type of capacitive touch sensor, such as may be integrated within a second type of interactive object (e.g., a shoe). The second type of capacitive touch sensor may include sensing elements having a second sensor layout. In this manner, a single removable electronics device may be utilized with multiple interactive objects including different types of pre-fabricated sensor assemblies.

According to example aspects, a removable electronics device in accordance with example embodiments can include one or more processors, a first communication interface configured to communicatively couple the removable electronics device to one or more computing devices, and a second communication interface configured to communicatively couple the removable electronics device to a